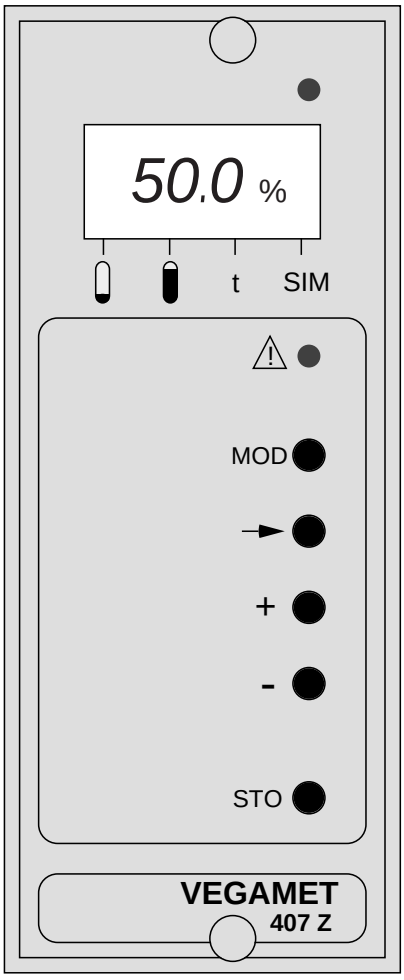
# VEGAMET 407 Z

TIB • Technical Information • Operating Instructions




**Signal conditioning instrument for continuous level measurement**

300
400
500
800

Signal conditioning instrument with plastic housing of series 400

Supply for
- one pressure sensor or
- one capacitive measuring electrode

Conditioning of analog transmitted measuring data

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## Contents of the instruction manual

The **Technical Information / Operating instructions** is called **TIB**. It contains all necessary information for correct:
- installation
- connection
- set-up
- parameter adjustment

of the signal conditioning instrument VEGAMET 407 Z.

If you feel that any points in this data sheet are not adequately covered our technical sales or service departments will be pleased to assist.

Additional copies of this data sheet are freely available and are automatically supplied with quotations and purchases product.

## Security information

The described module must only be inserted and operated as described in this TIB. Please note that other action can cause damage or destruction for which VEGA does not take responsibility.

The measuring systems certified as overfill protection acc. to WHG and as overfill protection acc. to the regulation for combustible liquids (VbF) are listed on page 6 and 7.

## Product description

The signal conditioning instrument VEGAMET 407 Z is used for manifold applications for continuous level measurement.

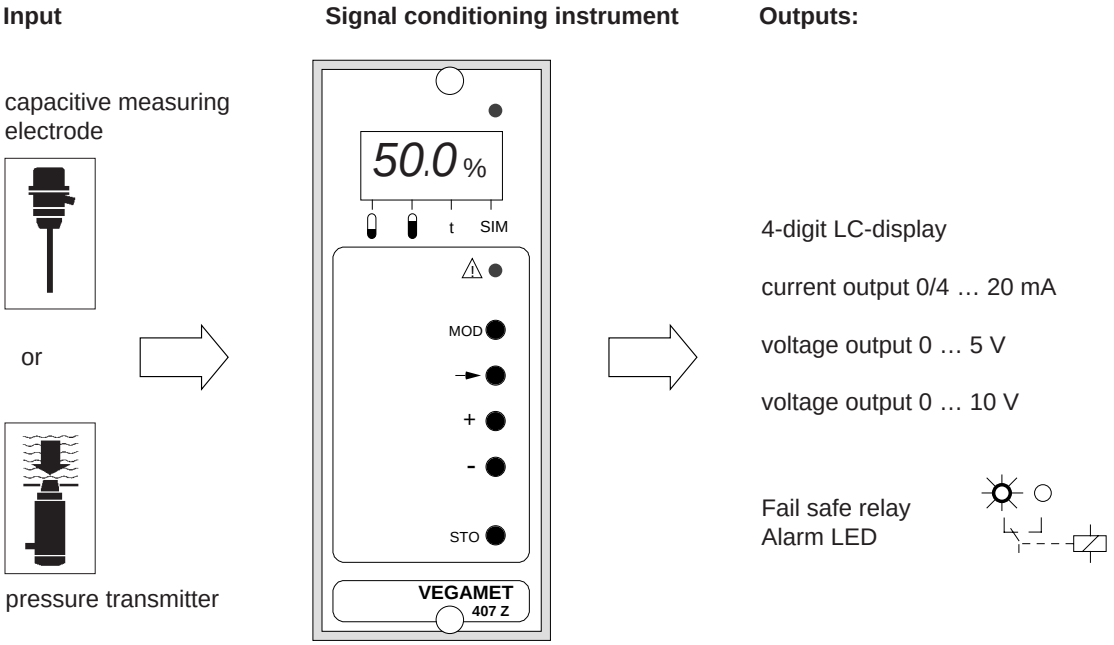
VEGAMET 407 Z is integrated in a series 400 plastic housing.

A sensor (pressure transmitter or capacitive measuring electrode) can be connected via a two-core line to the signal conditioning instrument. This line is responsible for the power supply from the signal conditioning instrument to the sensor. The measuring currents are transmitted analog from the sensor to the signal conditioning instrument and evaluated.

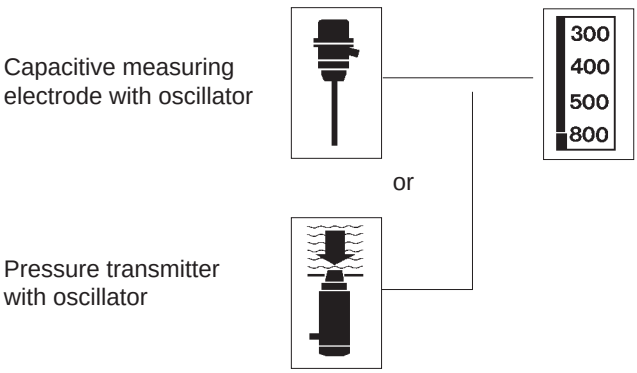
The signal conditioning instrument can be calibrated and adapted to the measurement by the user via parameter adjustment.

These adjustments are made without additional facilities and tools via a 5-button keyboard integrated on the front panel.

## Configuration of a signal conditioning instrument




## Configuration of a measuring system




**Signal conditioning instrument**
VEGAMET 407 Z mounted into plastic housing of series 400

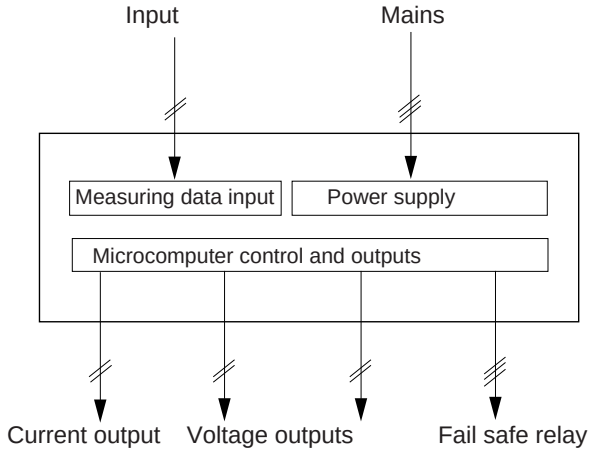
Optional auxiliary instruments e.g.:
- Overvoltage arresters
- Indicating meters VEGADIS 171 (connection 0 … 20 mA)
- Auxiliary level switch VEGASEL ……
- Safety barrier type 145

## Technical data

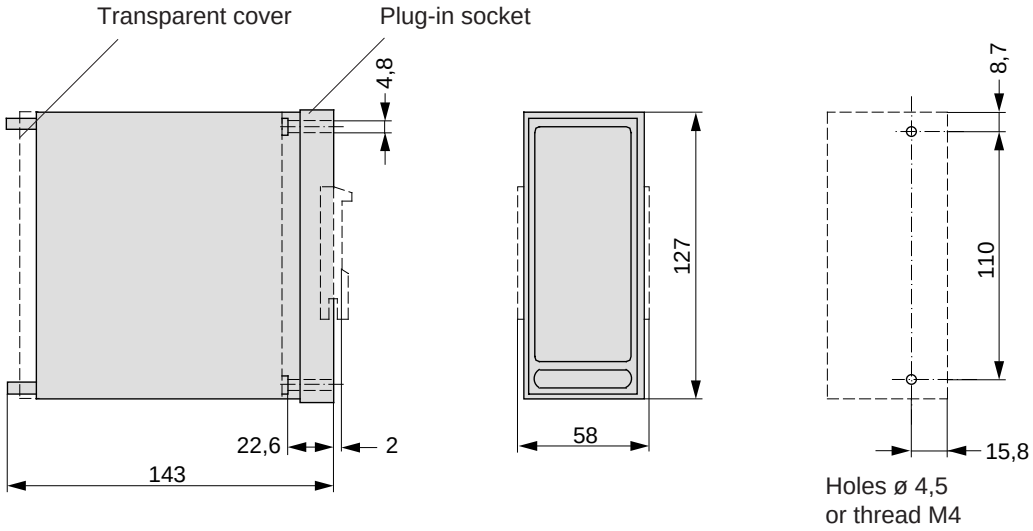
| | | | | |
|---|---|---|---|---|
| Power supply | Operating voltage | value | tolerance | frequency |
| | Standard | 230 V AC | +10 % –15 % | 50 / 60 Hz |
| | Options | 110 V AC<br>130 V AC<br>240 V AC | +15 % –10 % | 50 / 60 Hz |
| | | 24 V AC<br>42 V AC<br>48 V AC | +15 % –10 % | 50 / 60 Hz |
| | | 16 … 60 V DC | | |
| | Power consumption | approx. 6 VA | or 4 W | |
| Measuring data | Supply voltage for capacitive measuring electrode or pressure transmitter | 24 V (max. 26 V) short-circuit proof, galvanically isolated | | |
| | Data transmission | analog | | |
| | Connection cable | 2-core, unscreened (standard line) | | |
| | Resistance per conductor | max. 200 Ω | | |
| | Valid measured values | 2 … 22 mA | | |
| | Fault signal at | < 2 mA; > 22 mA | | |
| | Min. measuring distance | 300 µA | | |
| Indication | LC-display | 4-digit | | |
| Current output | Range | 0 … 20 mA or 4 … 20 mA | | |
| | Load | max. 750 Ω | | |
| | Galvanical separation | to power supply unit and input | | |
| | Resolution | 0,05 % of range | | |
| | Linearity error | 0,05 % of range | | |
| | Temperature error | 0,06 % / 10 K of sensor | | |
| Voltage output 1 | Range | 0 … 10 V, max. 1 mA | | |
| | Galvanical separation | to power supply unit and to input | | |
| | Resolution | 0,05 % of range | | |
| | Linearity error | 0,1 % of range | | |
| | Temperature error | 0,06 % / 10 K of sensor | | |
| Voltage output 2 | Range | 0 … 5 V, max. 1 mA | | |
| | Galvanical separation | to power supply unit and to input | | |
| | Resolution | 0,05 % of range | | |
| | Linearity error | 0,1 % of range | | |
| | Temperature error | 0,06 % / 10 K of sensor | | |
| Fail safe relay | Relay data: | | | |
| | 1 spdt | floating | | |
| | Contact material | Ag CdO and Au plated | | |
| | min. turn-on voltage | 10 mV | | |
| | switching circuit | 10 µA | | |
| | | AC | DC | |
| | max. turn-on voltage | U = 250 V | U = 60 V | |
| | switching circuit | I = 2 A | I = 1 A | |
| | max. breaking capacity | S = 125 VA | P = 54 W | |
| Operating conditions | Permissible operating temperat. | –20°C … +60°C | | |
| | Storage and transport temperat. | –20°C … +70°C | | |
| Electrical protective measures | Protection | IP 40 | | |
| | Protection class | II | | |
| Mechanical data | Series | Panel mounting, housing plastic ABS light grey | | |
| | Dimensions | W = 53 mm, H = 127 mm, D = 143 mm | | |
| | Weight | approx. 700 g | | |

## Galvanical separation

Block diagram




## Dimensional drawing (dimensions in mm)



## Approvals (for following measuring systems)

If measuring systems acc. to the below approval are installed, the legal documents have to be observed.

Approval as overfill protection acc. to **WHG**

Pressure transmitters, approved for the following measuring systems

| | |
|---|---|
| Type | D33, D34, D35, for type A, F, G, N, K<br>D36, Type G, N, F, S063<br>D37, Type G, N, S052<br>D38, Type G, N |
| Oscillator | E27, E27 B |
| Signal conditioning instrument | VEGAMET **407 Z** |
| Auxiliary level switch | VEGASEL 444, 441 B, 441 C |
| defined in test certificate no. | **PA-VI 810.76** |

Capacitive measuring electrodes, approved for the following measuring systems

| | |
|---|---|
| Type | 12.02, 12.12, 12.42 Ex, 12.72 Ex<br>22.02, 22.12<br>23.02, 23.12, 23.42 Ex, 23.72 Ex<br>25.02, 25.03, 25.12, 25.13<br>25.02 Ex, 25.03 Ex, 25.12 Ex, 25.13 Ex<br>26.02, 26.03, 26.12, 26.13<br>27.01, 27.11, 27.41 Ex, 27.71 Ex<br>32.04, 32.05, 32.14, 32.15<br>32.44 Ex, 32.45 Ex, 32.74 Ex, 32.75 Ex<br>42.04, 42.05, 42.14, 42.15<br>52.04, 52.05, 52.14, 52.15 |
| Oscillator | 117 A, 117/4 A, 117/4 A Ex |
| Signal conditioning instrument | VEGAMET **407 Z** |
| Auxiliary level switch | VEGASEL 444, 441 B, 441 C |
| defined in test certificate no. | **PA-VI 870.15** |

Measuring systems for the use in hazardous areas must only be operated in conjunction with pressure transmitters or capacitive measuring electrodes in Ex-version and safety barrier type 145.

see
- Conformity certificate PTB-no. Ex-85.B.2038
- diagram page 7.

## Approvals (continued)

Approval as overfill protection acc. to the regulation for combustible liquids **VbF**

Capacitive measuring electrodes, approved for the following measuring systems

Type ..... 12.02, 12.03, 12.12, 12.13
23.02, 23.03, 23.12, 23.13
27.00, 27.01, 27.10, 27.11

32.04, 32.05, 32.06, 32.07
42.04, 42.05, 42.06, 42.07

32.14, 32.15, 32.16, 32.17
42.14, 42.15, 42.16, 42.17

12.42 Ex, 12.43 Ex, 12.72 Ex, 12.73 Ex
23.42 Ex, 23.43 Ex, 23.72 Ex, 23.73 Ex
27.40 Ex, 27.41 Ex, 27.70 Ex, 27.71 Ex

32.44 Ex, 32.45 Ex, 32.46 Ex, 32.47 Ex
32.74 Ex, 32.75 Ex, 32.76 Ex, 32.77 Ex

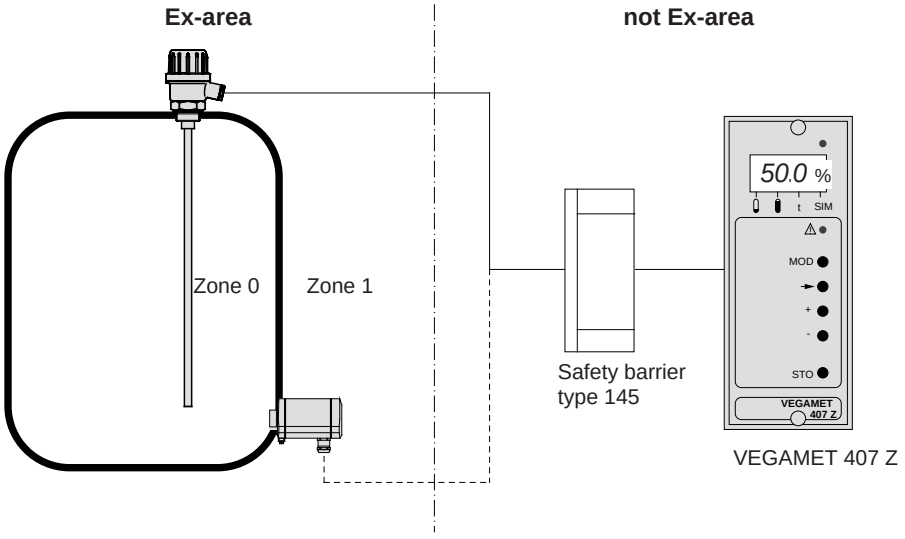
25.02 Ex, 25.03 Ex
25.12 Ex, 25.13 Ex

Oscillator ..... 117/4 A Ex
Signal conditioning instrument ..... VEGAMET **407 Z**
Auxiliary level switch ..... VEGASEL 444, 441 B, 441 C
defined in test certificate no. ..... **PTB-no. III B/S 2032 F**
and type approval ..... **01/PTB-no. III B/S 2032 F**

Measuring systems for the use in hazardous areas must only be operated in conjunction with pressure transmitters or capacitive measuring electrodes in Ex-version and safety barrier type 145. See conformity certificate PTB-no. Ex-85.B.2038.

**Transducer** (capacitive measuring electrode or pressure transmitter)
If the sensor is installed in hazardous areas, the special conditions of the conformity certificate must be observed.

**Signal conditoning instrument**
The signal conditioning instrument VEGAMET 407 Z must be generally installed outside hazardous areas (or special protective measures must be taken.



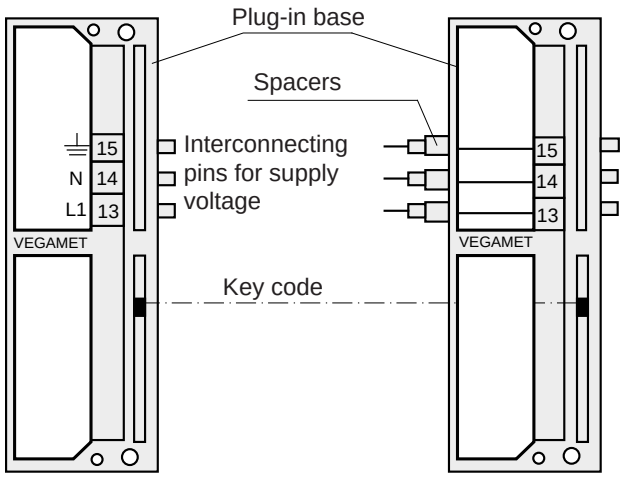
## Mounting instructions

The plug-in base is provided with
- field terminals
- interconnection pins
- spacers for installation in series
- key coded

For installation in series the interconnection pins are the power supply connections and the distance sleeves ensure that adjacent instruments have a minimum gap of 5 mm between each other.

Remove the interconnection pins on the first plug-in socket.

**Warning:** Beware of high voltage on power supply terminals.




In case of single mounting remove the interconnection pins and spacers, connect the supply voltage directly.

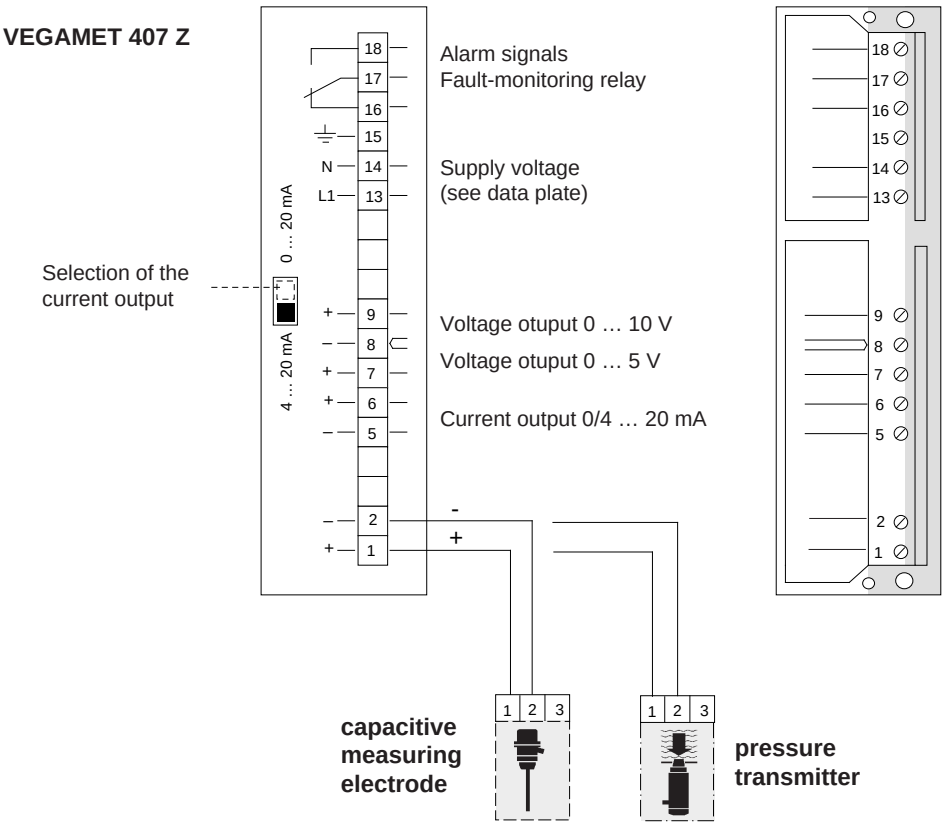
The key coded base prevents other series 400 instruments being inserted.
Use adapter no. 040 002 for mounting on standard rail.

## Electrical connection

Signal conditioning instrument back view (type plate)

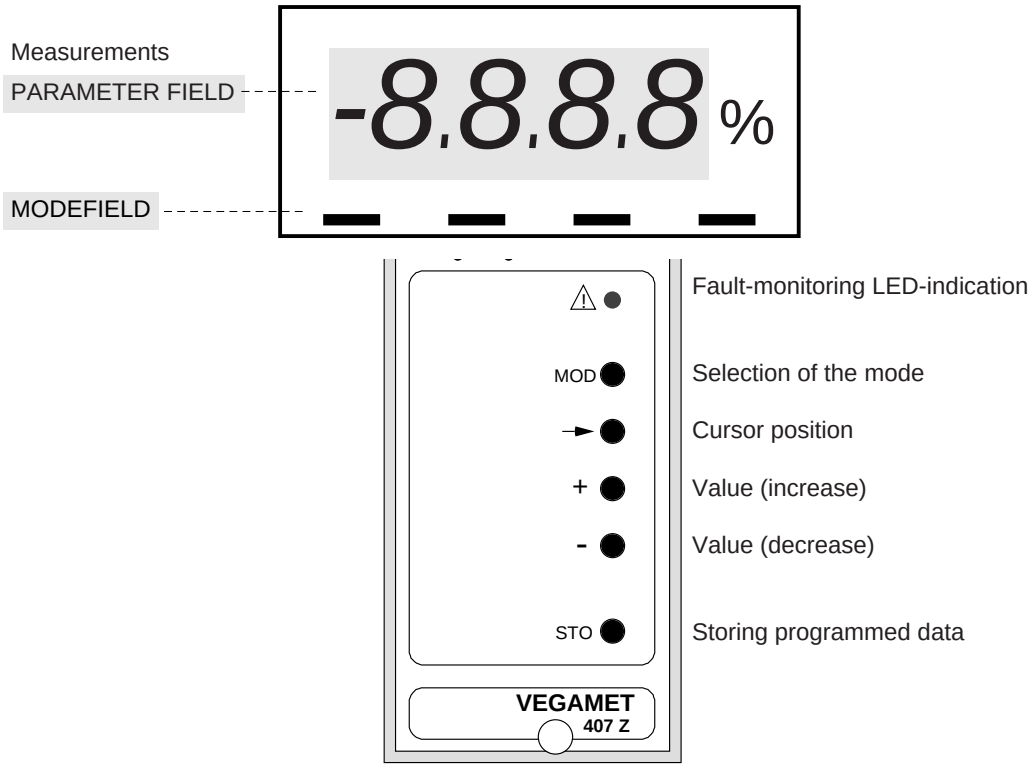
Plug-in socket with terminals

**VEGAMET 407 Z**




**Installation regulations:**
- The wiring between VEGAMET 407 Z and sensor (capacitive measuring electrode or pressure transmitter) can be made with standard cable.
- In case of strong electromagnetic interferences, screened cable must be used.
  The screening must be earthed at one sensor end.

## Indication and operating elements




**Measurements**

0.0 % ---------- 100.0 % Level 0 … 100 %

**Mode range**

Empty adjustment

Full adjustment

Adjustment in % or in mA

Integration time — 0 … 200 sec.

Simulation — -10 % … 110 %

Password — 0 - - 0 / 0407 (Password)

**Alarm signal**

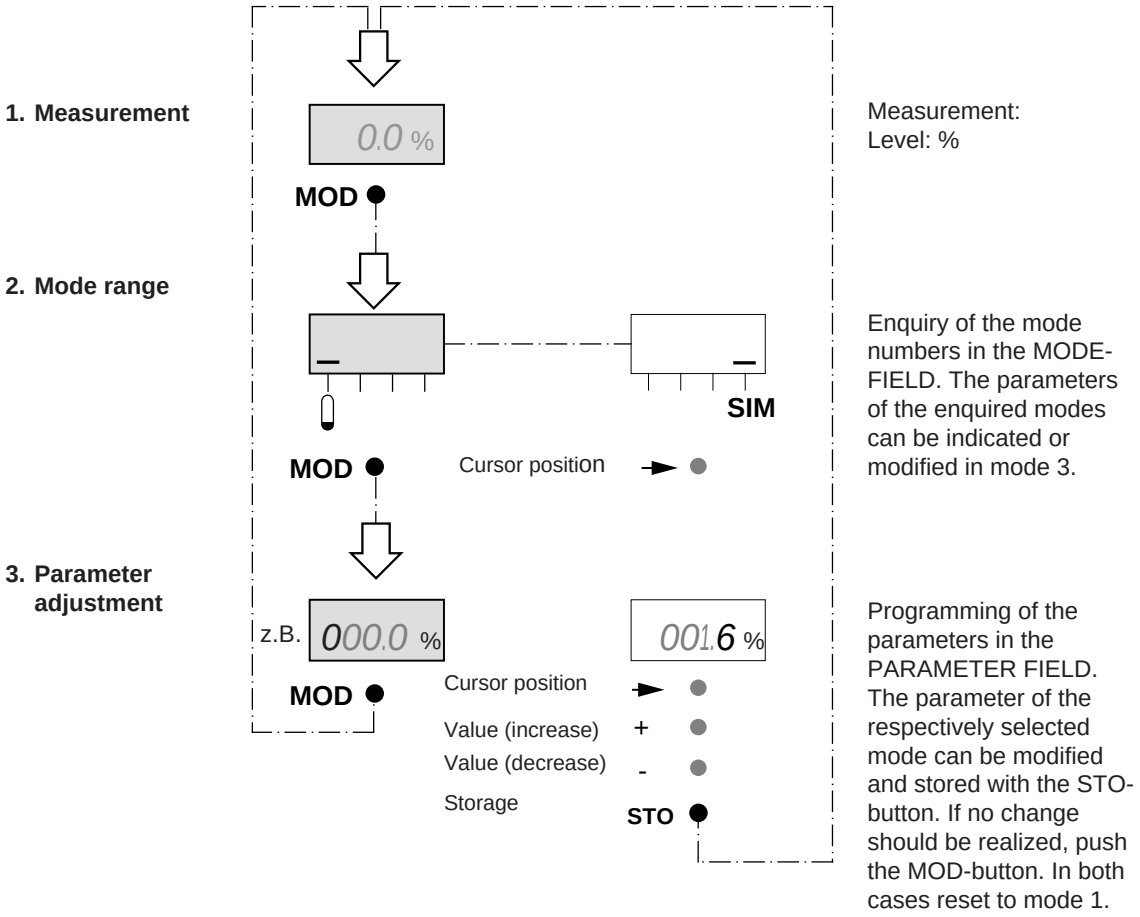
E1 ---------- E9

## Operation

The VEGAMET 407 Z has 3 modes which can be obtained by scrolling the **MOD**-button:

Mode:
1. Measurement
2. Mode range
3. Parameter adjustment

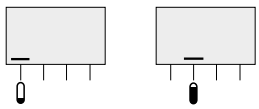
Note that if no pushbutton is operated, after a period of 60 minutes the display resets to level measurement.


1. Measurement
0.0 %
MOD
2. Mode range
SIM
MOD
Cursor position
3. Parameter adjustment
z.B.
000.0 %
001.6 %
MOD
Cursor position
Value (increase)
+
Value (decrease)
-
Storage
STO
Measurement:
Level: %
Enquiry of the mode numbers in the MODE-FIELD. The parameters of the enquired modes can be indicated or modified in mode 3.
Programming of the parameters in the PARAMETER FIELD. The parameter of the respectively selected mode can be modified and stored with the STO-button. If no change should be realized, push the MOD-button. In both cases reset to mode 1.

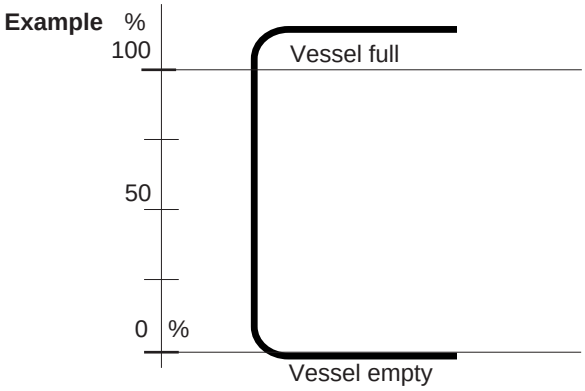
## Set-up (procedure)

- mounting socket
- connect capacitive measuring electrode or pressure transmitter with the mounting socket terminal 1 and 2, see page 8
- adjust the current output, see page 8
- check the connection and type plate
  push VEGAMET 407 Z onto mounting socket and fasten
- switch on power supply
  LED (green) voltage supply lights
  LED (red) fault signal lights
  fault monitoring relay remains de-energized
  software stage is indicated
- after approx. 2 sec.
  fault-monitoring LED extinguishes
  fault-monitoring relay is energized
  a meaningless figure is displayed
- program **empty and full adjustment**, see page 11
- if necessary, program
  integration time, see page 12
  password, see page 13

## Empty, full adjustment in %



The measurement range for level 0 % and 100 % is defined via the adjustment procedure.



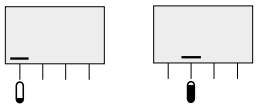

When the vessel is partly filled or emptied the programming is as described on the right, however with previously determined %-values.
The min. measuring range must correspond to a current Δ of > 300 µA.

**Full adjustment**
- fill vessel
- select mode in MODEFIELD
- program level 100 % in PARAMETER FIELD
- then store with STO

**Empty adjustment**
- empty vessel
- select mode in MODEFIELD
- program level 0 % in PARAMETER FIELD
- then store with STO

The empty and full adjustments may be performed in any order.

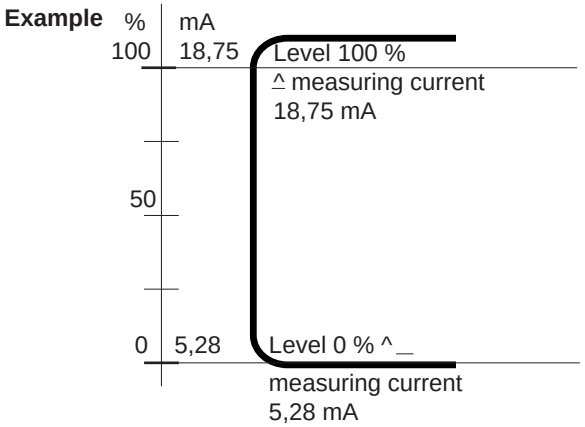
## Empty, full adjustment in mA



The measuring current values are coordinated to the levels 0 % and 100 % with the adjustment.

The measuring currents are experience values or can be taken from the attached test certificate.

The procedure is used:
- for adjustment without rate of product level change
- for correction of previous adjustments (alarm E3 or E4)
- for adjustment without connection of a capacitive electrode or a pressure transmitter (alarm E2)

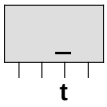



**Full adjustment**
- select mode in MODEFIELD
- push button **+** and button MOD simultaneously (data input for mA)
- program 18,75 mA in PARAMETER FIELD
- then store with STO

**Empty adjustment**
- select mode in MODEFIELD
- push button **+** and button MOD simultaneously (data input for mA)
- program 5,28 mA in PARAMETER FIELD
- then store with STO

The empty and full adjustments may be performed in any order.

## Integration time



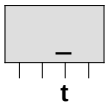

Application
- Where the product surface is agitated the system outputs may be stabilized by adjusting the integration time.

Important notes:
The integration time depends on the filling and emptying period of the vessel, i.e. **integration time** ≤ **filling / emptying time**. Mis-adjustment of the integration time may degrade output sensitivity.

Definitions
- range = 0 … 199 sec.
- (0 … 199 secs. corresponds to the definition in sec.)
  At 200 sec. effects a time period, the actual value is approx. 45 minutes.
- settings > 200 sec. are automatically limited to the max. value 200 sec.

**Example**
- integration time of e.g. 15 sec.
  - select mode **t** in MODEFIELD
  - program 15 sec. in PARAMETER FIELD
  - then store with STO

## Simulation mode




In the simulation mode it is possible to test the measuring system over the whole measuring range independent of the process.

Button + increases and
button – reduces
all output values.

The longer the simulation button + and – are pressed the greater the rate of change.

Integration time is ignored during the simulation sequence.

**Example** .....to activate the simulation ……
- select mode **SIM** in MODEFIELD
- activate the simulation with button MOD
- increase or reduce the output with button + or button –

| **Effects** | **within the measuring range** | **outside the measuring range** |
|---|---|---|
| | -10 % … 0 %.....100 % … 110 % | < -10 % or >110 % |
| | 0/4 mA.....20 mA | 22 mA |
| | 0 V.....10 V | 11 V |
| | 0 V.....5 V | 5,5 V |

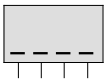
fault-monitoring-LED lights

fault-monitoring relay de-energizes

**Example** to end simulation ..... • push MOD–button again

Effects
- Cancel the simulated output values
- Transmits the true output values

## Password



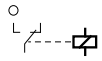
All parameters can be interrogated as previously described and their data indicated on the display.

Data input can be inhibited by programming the password.

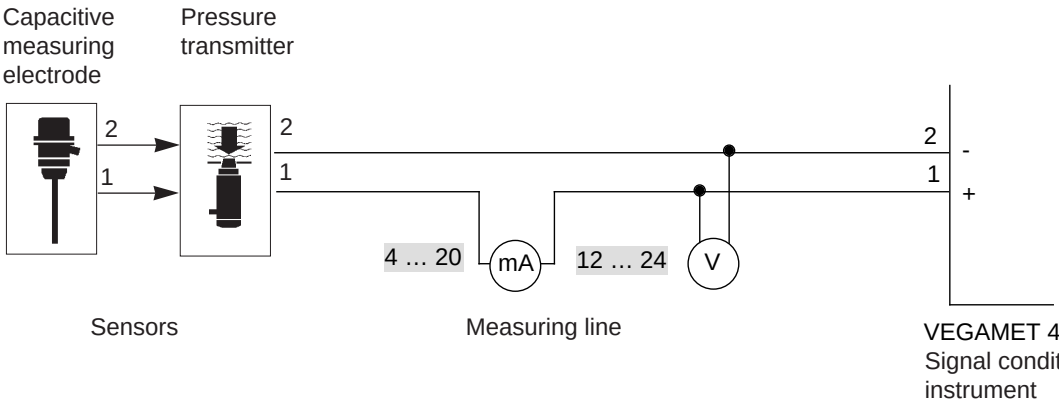
Activate password .....
- select mode **- - - -** in MODEFIELD
- program figure **1** in PARAMETER FIELD
- then store with button STO

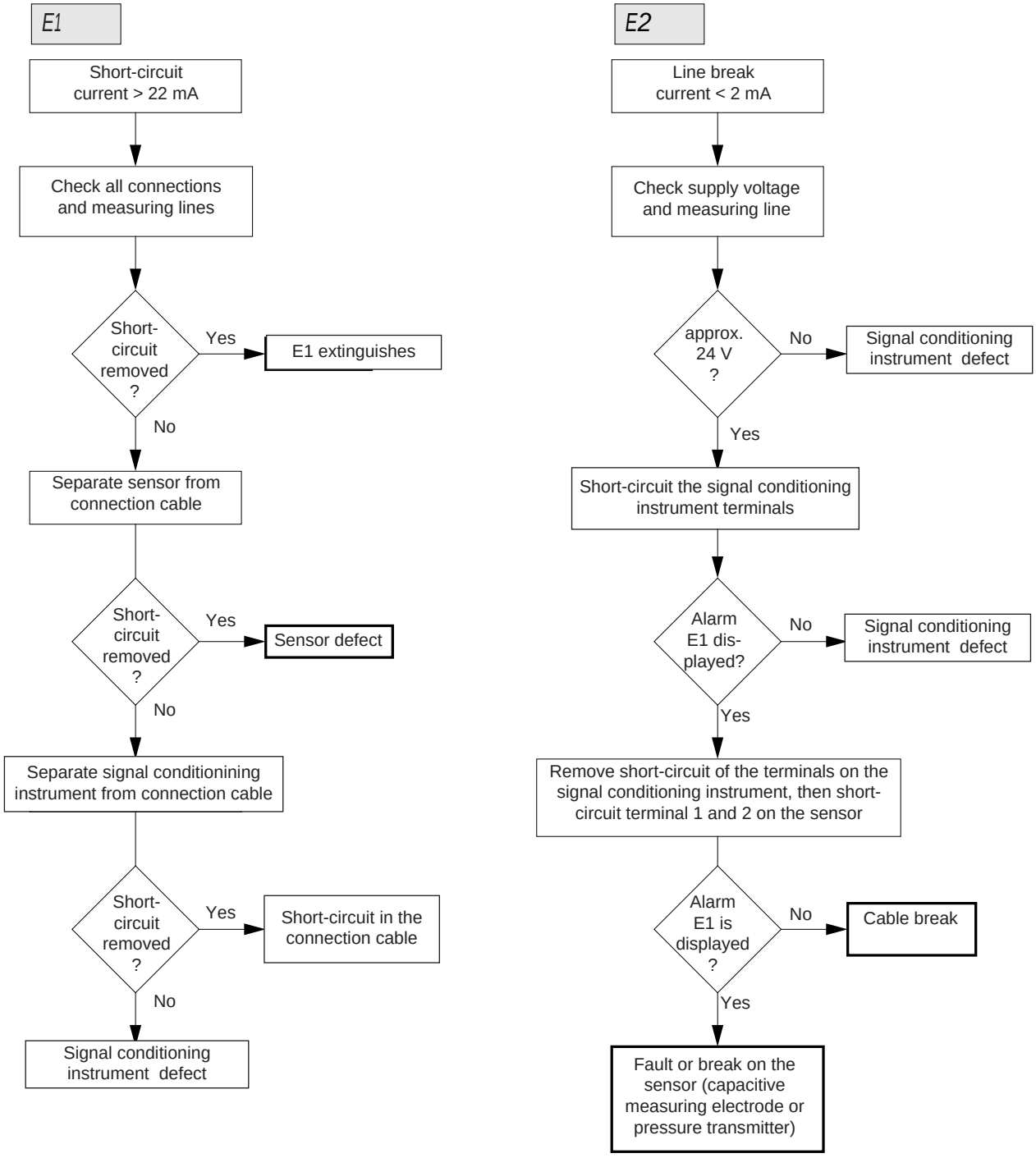
Adjust password .....
- select the mode required for parameter adjustment in the MODEFIELD, in the example mode **t**
- select data input, the keyword *0 - - 0* is displayed in the PARAMETER FIELD
- program *0407* as password
- then store with button STO
- the parameter adjustment of e.g. mode **t** can be made

## Alarm signals (fail safe)

| | Indication | Reason | Result |
|---|---|---|---|
| Measuring results | < - 10 % | Input below minimum limit (flashing) | without fail safe  |
| | > 110 % | Input above maximum limit (flashing) | |
| Error code | E1 | Connection cables reversed on short-circuit | with fail safe |
| | E2 | Line break | |
| | E3<br>E4 | Incomplete or incorrect adjustm. proced. (together with flashing mode segments) | |
| | E8.1 …<br>E8.4 | Fault during data transfer (acc. to STO) | Current output = 22 mA<br>Voltage output = 11 V or 5,5 V |
| | E9 | Fault in the EEPROM-memory | |

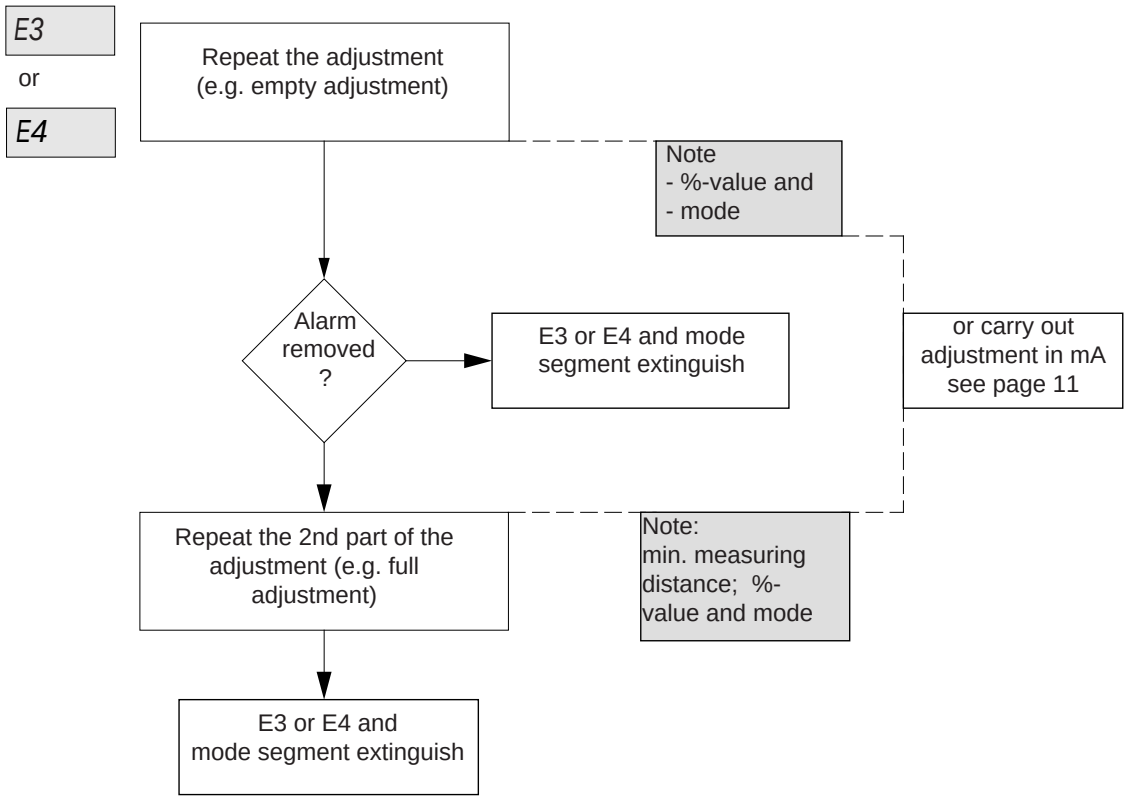
## Fault diagnosis related to E1 or E2



Fault diagnosis related to E3 = Adjustment had been carried with no or with too small level change.

Fault diagnosis related to E4 = The modes or %-values had been exchanged during adjustment


E3
or
E4
Repeat the adjustment (e.g. empty adjustment)
Note
- %-value and
- mode
Alarm removed ?
E3 or E4 and mode segment extinguish
or carry out adjustment in mA see page 11
Repeat the 2nd part of the adjustment (e.g. full adjustment)
Note:
min. measuring distance; %-value and mode
E3 or E4 and mode segment extinguish

**Help for fault diagnosis**

The measuring current stored during empty and full adjustment can be displayed in the mode range by pushing the plus-button.

Application with …… - inaccurate measurements or
- alarm E3 or E4

**Example:** Measuring current of the previous adjustment related to 0 %

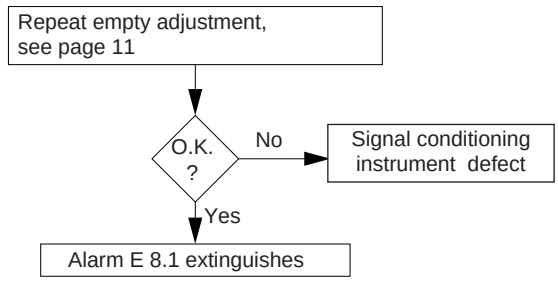
- select mode in MODEFIELD
- push plus-button, the adjustment current related to 0 %, is displayed in PARAMETER FIELD
- reset by pushing the MOD-button twice

Measuring current of the previous adjustment related to 100 %

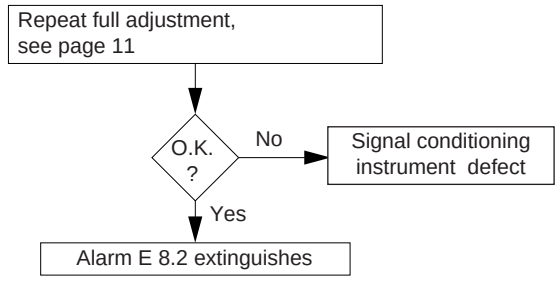
- select mode in MODEFIELD
- push plus-button, the adjustment current related to 100 %, is displayed in PARAMETER FIELD
- reset by pushing the MOD-button twice

## Fault diagnosis related to E 8.1

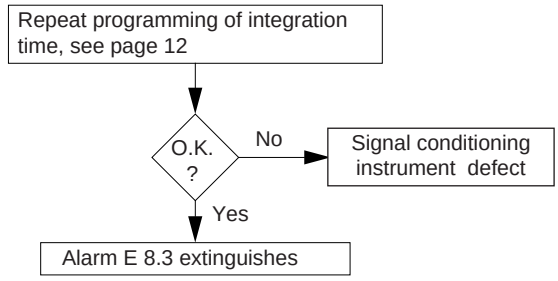
**E8.1** The empty adjustment data has not been transferred



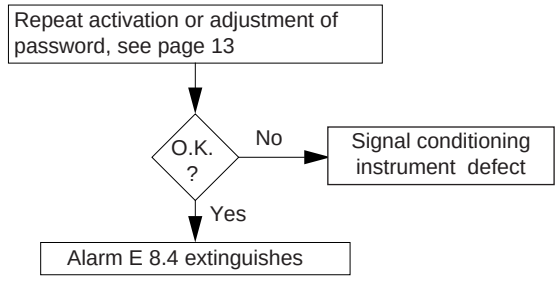

**E8.2** The full adjustment data has not been transferred




**E8.3** The integration time data has not been transferred

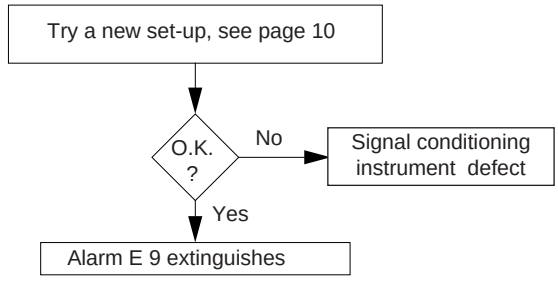



**E8.4** The password data has not been transferred




## Fault (data loss) in the EEPROM-memory

**E9**

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